REPLACEMENT SPECIFICATION PARAGRAPHS

Please amend the following paragraphs as indicated below:

[0050] Referring to Figs. 8, 9, and 10, the upper rotor 74 is connected to a shaft 79 driven by the motor 66. As shown in Fig. 7, the shaft 79 is supported within the head 52 via bearings 78. [[A]] As shown in Fig. 8, a downwardly extending flange 86 on the upper rotor 74 includes multiple spaced apart drain outlets 88. A skirt 82 surrounds the flange 86.

[0052] Referring now to Figs. 16, 17 and 18, a lower rotor 104 has a central opening 106 which aligns over the lower nozzle 92. A pair of spaced apart shoulders 108 on the top surface of the lower rotor 108 include tapered alignment slots or openings 110, as well as upwardly projecting wafer support pins 112. The shoulders 108 are spaced apart creating a robot or automation slot 114 shown in Fig. 16. This allows an end effector of a robot to move in underneath a wafer 80 supported on the support pins 112, to load and unload a wafer 80 into or out of the processor 50.

[0053] [[A]] Turning to Fig. 17, a locking subsystem or assembly 115 is provided on the lower rotor 104, to lock the lower rotor 104 into engagement with the upper rotor 74, during processing. The locking subsystem 115 includes a resilient retainer ring 118 on the bottom surface of the lower rotor 104, as shown in Fig. 17. The retainer ring 118 includes spaced apart ring tabs 120. A cam 116 is associated with each ring tab 120. Referring momentarily back to Figs. 6 and 7, an annular actuating ring 130 is positioned around the outside of the pedestal 102. Ring actuators 132 in the base 54 move the actuator ring 130 up and down. As the actuator ring 130 moves up, it pushes on the cams 116. The cams pivot or rotate, pulling the ring tabs 120 radially inwardly, to

release or disengage from the upper rotor. When the cam actuators 132 move the actuator ring 130 to a lowered position, the cams 116 rotate to the position shown in Fig. 18, releasing the ring tabs 120 and allowing the ring tabs 120 to resiliently extend outwardly to engage the upper rotor. In this way, the locking system 115 locks the upper and lower rotors together, for processing, and releases them, for loading and unloading. As shown in Figs. 8 and 18, an O-ring or seal 122 within a groove on the lower rotor 104 seals the lower rotor 104 against the flange 86 of the upper rotor 74, when the processor 50 is in the closed position. The ring actuators 132 and valve actuators 134 are preferably pneumatically operated. The upper and lower rotors are preferably Teflon (fluorine resins) to better resist corrosion by process chemicals. Other components may be stainless steel.

[0054] Referring to Figs. 11 and 17, the bottom surface of the lower rotor 104 includes a bayonet or interrupted tab/slot fitting 124, which engages with a complimentary fitting on the pedestal 102. As shown e.g., in Fig. 10, this allows the lower rotor 104 to be securely supported on the pedestal 102 during loading and unloading, and also allows the lower rotor to spin within the base 54, when engaged with the upper rotor 74. Referring to Figs. ~~8,~~ 9 and 10, alignment pins 75 on the upper rotor engage into pin slots 110 on the lower rotor, when the upper rotor is brought down into engagement with the lower rotor. ~~This~~ Referring to Figs. 8, 9, and 10, this aligns the upper and lower rotors, and also the wafer 80, about the spin axis 105 of the processor 50. The wafer 80 is aligned with the spin axis 105 via the alignment pins 75 in contact with, or closely adjacent to the edges of the wafer 80. The wafer is supported below by the support pins 112 on the shoulders 108 of the lower rotor 104.

The wafer 80 is supported, positioned, or held down from above, by support pins 77 extending downwardly from the upper rotor 74. The wafer or workpiece 80 is supported or aligned axially via the alignment pins 75.

[0055] Fig. 14 shows an alternative base design 140 which is similar to the base 54 shown in Figs. 11, 12 and 13, but further includes a supplemental air supply pipe or snorkel 146 connecting to the lower nozzle 92. As the upper and lower rotors spin within the processor 50, a low pressure zone is created adjacent to the spin axis 105. Air is drawn in through the pipe 146 to the nozzle 92, to assist during drying steps. The inlet or opening 147 of the pipe 146 is vertically above the top of the processor 50. Consequently, the potential for airborne particles entering the pipe 146 and the process chamber 125 formed between the rotors (and shown in Figs. 8 and 10), is reduced. Referring still to Fig. 14, in the base embodiment 140 shown, a supplemental side spray nozzle 144 is also provided to spray a broader area of the bottom surface of the wafer 80.

[0057] Figs. 19, 20 and 21 show the upper and lower rotors in isolation. The other features and components of the head 52 and the base 54 are not included in these views, only for purpose of illustration, because except for manufacture and servicing, the upper and lower rotors remain with the head and base, respectively. Fig. 19 shows the upper rotor 74 in an up or open position, for loading or unloading a wafer. The upper rotor 74 is lifted up, along with the head 52 (shown in Figs. 3-6), when the lift arm 62 (shown in Fig. 5) lifts the head. As shown in Fig. 19, the head 52 including the upper rotor 74 is lifted sufficiently so that the skirt 82 clears or is above the robot end implement slot 114.

[0058] Figs. 20 and 21 show the head 52 in the closed or down position, so that the upper rotor 74 is engaged with the lower rotor 104. The cam actuation ring 130 is in the released or down position, allowing the ring tabs 120 of the retainer ring 118 to extend outwardly, so that the tabs engage into grooves or slots in the flange 86 of the upper rotor 74. As a result, the upper and lower rotors are connected, causing the lower rotor and wafer to spin with the upper rotor. As shown in Figs. 20 and 21, as the upper and lower rotors are brought together, they form a process chamber 125. Referring to Figs. 8 , 9,~~ 10, 20 and 21~~ and 10, the wafer 80 is supported within the chamber 125 by upper and lower support pins 77 and 112. Process liquids and/or gasses are sprayed or applied onto the upper and lower surfaces of the wafer 80 via the upper nozzle 70 and lower nozzle 92, preferably while the wafer 80 is spinning along with the rotors 74 and 104. As the process fluid moves radially outwardly via centrifugal force, the flow path is controlled by location of the outlets. The seal 122 prevents fluids from moving out of the chamber 125, except through the outlets 88 shown in Fig. 9.

[0060] Another aspect of the frame 42 is that it has a dimensionally stable deck or top surface 230. The deck 230 has positioning elements, such as tapered pins 235 (also shown in Fig. 6), at precise locations for positioning the process chambers 50. A transport system, including the robots 44 movable along rails or tracks 46, as shown in Fig. 2, may be mounted directly to the floor or platform 250 of the frame 42. By precisely locating the process chambers 50 on the deck 230 via the positioning elements 235, and by supporting the transport system or robots 44 in a fixed relation to the deck 230, process chambers 50 can be replaced from the system 30, without the

need to recalibrate movement of the robot 44. As a result, the process chambers 50 are substantially interchangeable and can be quickly replaced, without recalibration of the system 30.

[0062] During initial calibration, the robots 44 are programmed to move with great precision, to accurately place a wafer 80 onto the support pins 112 of the lower rotor 104, shown in Figs. 8, 10, 16 and 18. To avoid damaging the wafer 80, the robot 44 must place the wafer 80 within the circle formed by the alignment pins 75 of the upper rotor shown in Figs. 6 and 9. If the robot 44 places the wafer outside of the target area, the wafer 80 can be damaged as the upper rotor is moved down into engagement with the lower rotor. In addition, for use with other types of spin processors not having precise wafer alignment features (such as pins 75), precise movement and loading by the robot is advantageous to avoid placing the wafer eccentrically in the chamber. By precisely locating the mounting ring 56 and robot 44 relative to the deck 230, the position of the lower rotor 104, of any processor 50 installed in the system 30, is also precisely located relative to the robot. Accordingly, regardless of replacing or interchanging of processors 50, the robot 44 can accurately load and unload wafers 80, without recalibration.

[0071] Fig. 25 shows an alternative processor 300 which may be used in the system 30 shown in Figs. 1 and 2. The processor 300 is similar to the processor 50 shown in Figs. 3-21, with the following changes. The fluid delivery line 304 connecting into the upper nozzle manifold 68 (shown in Fig. 6) is supplied with process fluid through a valve assembly 306. As shown in cross section in Fig. 26, the valve assembly 306 has an array of valves which can be opened to connect a fluid source

line to the delivery line 304 extending into the processor 300. Specifically, the valve assembly 306 includes an aspiration valve 307 connecting to an aspiration line 308; a DI water valve 311 connecting to a DI water line 310; a first liquid process chemical valve 312 connecting with a first liquid process chemical line 313; and a second liquid process chemical valve 315 connecting with a second liquid process chemical line 314. A flow meter 338 is positioned at the end of the valve assembly 306 to measure flow in the delivery line 304.

[0072] A fifth valve, or a recovery valve 320 in the valve assembly 306 is connected to an inlet 332 of a pump 330 via an adapter 322. An outlet 334 of the pump 330, shown in Fig. 27, connects to a first or second liquid process chemical source via a fluid line 336. The pump 340 is typically operated via compressed air supplied into the pump housing via a fitting 340. While electrical valve operation may be used, pneumatic control is preferred where flammable or combustible process chemicals (such as solvents) are present. The compressed air for driving the pump 330 is supplied from a source 345 within the manufacturing facility, shown schematically in Fig. 25. The pump 330 is attached to the valve assembly 306 via mounting plate 331. For use in the system shown in Figs. 1 and 2, a separate reclaim subsystem including the valve assembly 306 and pump 330, is used with each processor.